DRAFT 4/97

4.14 Test of Fracture Transport With Matrix Diffusion

This test verifies that FEHM has correctly implemented the solute transport solution with equilibrium sorption in two dimensions. Figure 56 shows that FEHM's numerical solution is in good agreement with the analytical solution of Tang et al. (1981) for test cases that include matrix diffusion with no sorption, sorption in the matrix, and sorption on the fracture surfaces and in the matrix. The slight discrepancies are probably due to numerical errors associated with insufficiently small grid spacings adjacent to the fracture. This would render the solution inaccurate at early times in the simulation when concentration gradients near the fracture are largest. Nonetheless, the agreement is almost certainly adequate for any analysis that would be made using these model results. The results, compared numerically to the analytical solution (found in files *tang1.analyt*, *tang2.analyt*, and *tang3.analyt*), are given in Table 56. The maximum absolute error for these runs was less than 0.028, and the maximum percent errors ranged from 4.7 to 13.4% for concentration values greater than 0.1. The RMS error ranged from 0.0014 to 0.0022. These results meet the acceptance criteria for this test suite developed in Chapter III.

Table 56. Results of the fracture-transport/matrix-diffusion test

V&V test	Maximum error	Maximum % error	RMS error
Concentration versus time at the outlet node			
No sorption	0.2810e-01	9.094	0.1412e-02
Matrix sorption	0.1759e-01	13.38	0.2205e-02
Fracture and matrix sorption	0.1707e-01	4.662	0.2108e-02

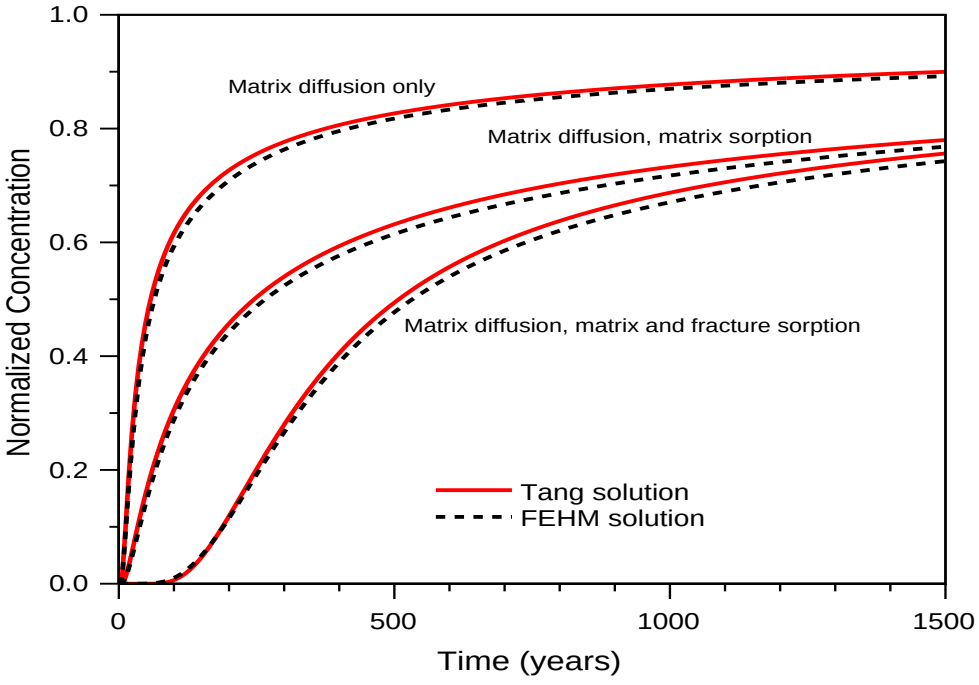

Figure 56. Comparison of FEHM and Tang analytical solutions for concentration versus time for the matrix-diffusion model.